

WHAT IS CLAIMED IS:

1. A method for cleaning a translucent tube for a discharge lamp having a luminous bulb portion, comprising the steps of:

5       introducing a cleaning fluid from one end of the translucent tube; and

          allowing the cleaning fluid to flow while bringing the cleaning fluid in contact with at least an inner face of the luminous bulb portion of an inner face of the translucent  
10       tube, thereby removing impurities attached on the inner face of the luminous bulb portion.

2. The method for cleaning a translucent tube for a discharge lamp of claim 1, wherein in the step of removing  
15       impurities, the cleaning fluid is allowed to flow while being in contact with an outer face of the translucent tube in the same step, thereby removing impurities attached on the outer face of the translucent tube.

20       3. The method for cleaning a translucent tube for a discharge lamp of claim 1, wherein the step of introducing a cleaning fluid includes the steps of:

          disposing the translucent tube in a container for containing a cleaning liquid as the cleaning fluid such that  
25       ends of the tube are positioned in a substantially vertical direction; and

          injecting the cleaning liquid into the container, and

the step of removing impurities includes the steps of:

elevating a liquid surface of the cleaning liquid above an upper portion of the luminous bulb portion of the translucent tube for a discharge lamp; and

5        lowering the liquid surface of the cleaning liquid below a lower portion of the luminous tube portion.

4.    The method for cleaning a translucent tube for a discharge lamp of claim 3, wherein the step of elevating the  
10    liquid surface of the cleaning liquid and the step of lowering the liquid surface of the cleaning liquid are repeated.

5.    The method for cleaning a translucent tube for a  
15    discharge lamp of claim 3, wherein the step of lowering the liquid surface of the cleaning liquid is performed such that the liquid surface of the cleaning liquid is lowered below a lower end of the translucent tube.

20    6.    The method for cleaning a translucent tube for a discharge lamp of claim 3, wherein the step of elevating the liquid surface of the cleaning liquid is performed such that the liquid surface of the cleaning liquid is elevated above an upper end of the translucent tube.

25

7.    The method for cleaning a translucent tube for a discharge lamp of claim 3, further comprising the step of

discharging the cleaning liquid in the container from the container.

8. The method for cleaning a translucent tube for a  
5 discharge lamp of claim 3, wherein an ending point of  
cleaning is determined by monitoring a concentration of the  
impurities contained in the cleaning liquid in the container.

9. The method for cleaning a translucent tube for a  
10 discharge lamp of claim 3, wherein the translucent tube is  
disposed using a holding tool for holding a plurality of  
translucent tubes such that ends of the tubes are positioned  
in a substantially vertical direction.

10 10. The method for cleaning a translucent tube for a  
discharge lamp of claim 3, wherein the cleaning liquid is one  
selected from the group consisting of ultrapure water, pure  
water, deionized water, hydrofluoric acid aqueous solution  
and hydrogen peroxide aqueous solution, and a combination of  
20 one of these cleaning liquids and cleaning fine particles.

11. The method for cleaning a translucent tube for a  
discharge lamp of claim 3, wherein a plurality of kinds of  
impurities are attached on the inner face of the luminous  
25 bulb portion as the impurities, the method comprising at  
least:

a first step of introducing a first cleaning liquid as

the cleaning liquid from the one end of the translucent tube with respect to a first kind of impurities of the plurality of kinds of impurities, and

a second step of introducing a second cleaning liquid other than the first cleaning liquid as the cleaning liquid from the one end of the translucent tube with respect to a second kind of impurities other than the first kind of impurities of the plurality of kinds of impurities.

10 12. The method for cleaning a translucent tube for a discharge lamp of claim 1, wherein the cleaning fluid is either one of gas, liquid, or fine particle powder, and

the step of removing impurities attached on the inner face of the luminous bulb portion is performed by discharging the cleaning fluid introduced from one end of the translucent tube for a discharge lamp from the other end of the translucent tube for a discharge lamp.

13. The method for cleaning a translucent tube for a discharge lamp of claim 12, wherein the cleaning fluid is inert gas.

14. An apparatus for cleaning a translucent tube for a discharge lamp comprising:

25 a container for accommodating a translucent tube for a discharge lamp having a luminous bulb portion and for containing a cleaning liquid;

an injection pipe or an injection tube through which the cleaning liquid is injected into the container;

a discharge pipe or a discharge tube through which the cleaning liquid in the container is discharged; and

5 a concentration monitoring meter for monitoring a concentration of impurities that was attached on the translucent tube and is contained in the cleaning liquid in the container.

10 15. The apparatus for cleaning a translucent tube for a discharge lamp of claim 14, wherein the concentration monitoring meter has a function to determine an end of cleaning by comparing an electrical conductivity of the cleaning liquid in the container or the cleaning liquid  
15 discharged from the container with a reference value, an electrical conductivity of the cleaning liquid injected to the injection pipe or the injection tube being used as the reference value.

20 16. The apparatus for cleaning a translucent tube for a discharge lamp of claim 14, wherein the container has an airtight structure that prevents the cleaning liquid in the container from being in contact with air outside the container.

25

17. A discharge lamp comprising a luminous bulb and sealing portions extending from the luminous bulb, the luminous bulb

enclosing a luminous material and including a pair of electrodes opposed to each other therein,

wherein the discharge lamp is produced by a method for producing a discharge lamp comprising the steps of:

5       preparing a translucent tube for a discharge lamp including a luminous bulb portion that becomes a luminous bulb of the discharge lamp, and side tube portions extending from the luminous bulb portion, the translucent tube having been subjected to a cleaning process;

10       inserting an electrode assembly including metal foils and electrodes connected to the metal foils into the side tube portion such that heads of the electrodes are positioned inside the luminous bulb portion; and

15       forming the sealing portions by tightly attaching the metal foils of the electrode assembly to the side tube portions,

the cleaning process comprising the steps of:

20       (a) introducing a cleaning fluid from one end of a translucent tube for a discharge lamp including a luminous bulb portion that becomes a luminous bulb of the discharge lamp, and side tube portions extending from the luminous bulb portion; and

25       (b) allowing the cleaning fluid to flow while bringing the cleaning fluid in contact with at least the inner face of the luminous bulb portion of the inner face of the translucent tube, thereby removing impurities attached on the inner face of the luminous bulb portion,

wherein the step (a) includes a step (a-1) of disposing the translucent tube in a container for containing a cleaning liquid as the cleaning fluid such that ends of the translucent tube are positioned in a substantially vertical direction; and a step (a-2) of injecting the cleaning liquid into the container, and

the step (b) includes a step (b-1) of elevating a liquid surface of the cleaning liquid above an upper portion of the luminous bulb portion of the translucent tube; and a step (b-2) of lowering the liquid surface of the cleaning liquid below a lower portion of the luminous tube portion.

18. The discharge lamp of claim 17, wherein

at least mercury as the luminous material, a rare gas and halogen are enclosed in the luminous bulb, and the luminous bulb is made substantially of quartz glass, and the electrodes are made substantially of tungsten, and

a mole number of the halogen is larger than a sum of a total mole number of metal elements that have a property of bonding to the halogen and are present in the luminous bulb (except for tungsten and mercury), and a mole number of the tungsten present in the luminous bulb after evaporated from the electrodes during lamp operation.

19. The discharge lamp of claim 18, wherein

the mole number of the halogen enclosed in the luminous bulb is not less than five times the total mole number of

sodium (Na), potassium (K), lithium (Li), chromium (Cr), iron (Fe) and nickel (Ni) present in the luminous bulb.

20. The discharge lamp of claim 17, wherein
- 5        the discharge lamp is a mercury lamp in which a bulb wall load of the luminous bulb is  $80\text{W}/\text{cm}^2$  or more.

09031703-050904  
T06050: 28/15350